

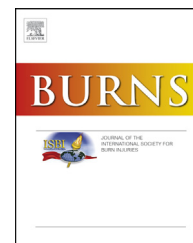


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Steam inhalation: More harm than good? Perspective from a UK burns centre

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ABSTRACT

Introduction: Steam inhalation is common practice in UK households for coryzal symptoms in adults and children. Steam inhalation has the potential to and has caused significant scald injuries, predominantly due to unintentional contact with the hot water used.

Methods: The authors used electronic health records to retrospectively identify all patients admitted with scald injuries secondary to steam inhalation over a 2-year period from January 2018–December 2019 at Chelsea and Westminster Hospital, a regional burns centre. Data collected included patient demographics, mechanism of burn, as well as burn size, depth, treatment and any associated complications. An International Burns Injury Database enquiry assessed the national prevalence steam inhalation scalds over the same time period. **Results:** 19 adult and paediatric patients were identified in our centre over a 2-year period, with an age range of 2 weeks to 91 years old. The majority (16/19, 84%) of patients received burns to their lower body, with three patients receiving burns to their chest and/or upper limbs. Six patients underwent surgery, 98 clinic appointments were utilised and the total length of hospital stay was 83 days. The estimated total cost of treating these 19 patients was over £31,872. Nationally, 201 cases were identified between Jan 2018–Dec 2019.

Conclusions: Scald injuries secondary to steam inhalation have a significant impact both in terms of hospital stay and cost. Since this study captured only patients admitted to hospital, the true negative impact of steam inhalation is likely to be much higher than calculated. Better public awareness on the risks of steam inhalation and primary prevention policies could reduce the frequency of such injuries.

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1. Introduction

Steam inhalation is a practice which came to European prominence in the Victorian times and has been used to clear a number of respiratory complaints including the common cold [1], bronchiolitis [2] and croup [3]. Originally practiced by inhaling steam directly over boiling water, methods have evolved to modern vaporisers whereby water is heated by

passing over electrodes immersed in water, and may involve addition of scented oils [4].

The National Institute for Clinical Excellence (NICE) currently recommends [5] that steam inhalation may be used as a symptomatic remedy, which may “theoretically help congested mucus drain better and heat may destroy the cold virus, as it does *in vitro*”. A COCHRANE review [1] found evidence to be equivocal but that it did lead to symptom relief in the common cold. However, overall it found that evidence supporting steam

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inhalation in the treatment of the common cold was inadequate to recommend it for routine clinical practice.

Whilst none of the trials in the COCHRANE review found steam inhalation to cause a worsening of respiratory symptoms, steam inhalation has been associated with other complications, most notably scald injuries. Although NICE guidelines state that “care should be taken to avoid scalding” during steam inhalation, scald injuries secondary to steam inhalation have been widely publicised in the recent past [4,6–8], and as early as 1959 [2]. Scalds remain a significant cause of burn, particularly in the paediatric population, accounting for over 65% of burns in children under 5 years of age [9].

We found limited literature assessing scalds as a result of steam inhalation therapy. Previous papers have looked at cases in adults and children in the Netherlands [10] or in paediatric populations in Australia [4] and Wales [11], but no previous paper has assessed steam inhalation related scalds in adult and paediatric populations in the UK.

2. Aim

Given concern over the frequency of steam inhalation related scalds at our unit, this paper had several aims:

To evaluate incidence of steam inhalation related scalds in a regional burns centre in London, England over a two-year period from January 2018–December 2019.

To detail the course of management of this cohort of patients, including mechanism and indication of injury, size and depth of burn, subsequent treatment and length of hospital stay.

To review previous literature on the topic and provide evidence for future primary prevention programmes and greater public awareness as to the seriousness of steam inhalation related scalds.

3. Method

Retrospective study of all patients admitted with scald injuries to a regional burns centre in London, England, over a 2-year period from January 2018–December 2019.

Chelsea and Westminster is a regional burns centre and part of the London and South East England Burn Network (LSEEBN). LSEEBN is one of four operational delivery networks and services a population of around 21 millions people. Chelsea and Westminster Hospital provides care to the population within the M25. The service has both paediatric and adult services. The children unit (Mars ward) has 6 inpatient beds and a busy outpatient clinic, as well as elective operating slots in the paediatric theatres. The adults unit consists of 9 ward beds, 2 ITU beds, 2 HDU beds, a devoted burns theatre and an outpatient clinic.

Data was collected using the hospital burns database, identifying all patients admitted secondary to scald injuries. Documented histories from all scald injuries were then screened to identify steam inhalation related injuries. Patients of all ages admitted for more than 12h were included, as this is what qualified as admission on the hospital database.

Data collected included:

- Patient demographics including age at burn and gender

- Indication for steam inhalation
- Admission and discharge date
- Mechanism of burn
- % total body surface area (TBSA) of burn
- Location and depth of burn
- Management of burn including dressings and operative procedures
- Any associated complications

The data collected contained no patient identifiable data and was collected for audit and service evaluation purposes. Approval from the Ethics Committee was not required. Data is presented as percentages and ratios, and was calculated in Microsoft Excel.

4. Results

4.1. Demographics

Over a 2-year period, 19 patients (both adults and children) were admitted for treatment of scalds secondary to steam inhalation therapy. For context, over the same time period January 2018–December 2019, 924 patients were admitted to Chelsea and Westminster Hospital with any kind of burn, 504 of which sustained scalds.

The majority (13/19, 68%) were female with the remaining 6/19 (32%) patients male (see Table 1).

The age range was 2 weeks to 91 years, with a mean age of 26.25 years and a median age of 16 years. Nine of the patients were paediatric (under 16 years of age).

Of the paediatric patients, 8 had no past medical history and 1 had mild eczema, controlled with topical agents.

Of the adults, 6 (60%) had no past medical history. One adult patient had a previous traumatic head injury, one had hypertension and previous breast cancer, one had hypertension alone and one had osteoporosis and vitamin D deficiency.

Table 1 – Patient age, gender and past medical history.

Age at burn (years)	Gender	Past medical history
0 (2 weeks)	Female	None
0 (9 months)	Female	None
1	Female	None
2	Male	Eczema
6	Female	None
6	Male	None
8	Male	None
9	Male	None
10	Female	None
16	Male	None
20	Female	None
23	Female	None
26	Male	Head injury
36	Female	None
42	Female	None
57	Female	HTN, previous breast cancer
71	Female	None
74	Female	HTN
91	Female	Osteoporosis, vitamin D deficiency

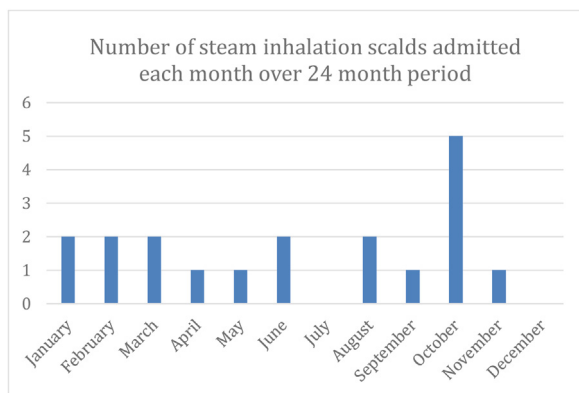


Fig. 1 – Number of admissions secondary to steam inhalation scalds each month, over a 24-month period.

Eighty per cent (8/10) were completely independent, one had BD carers and one had their father as a main carer.

The total number of hospital admissions per month secondary to steam inhalation scalds over the two-year period is shown in Fig. 1.

The commonest month for steam inhalation related burns admissions was October, with 5 admissions.

Autumn (Sept–Nov) was the season with the most patients over the two years, with 7 cases admitted. Spring (March–May), summer (June–Aug) and winter (Dec–Feb) each had a total of 4 patients admitted over the two years.

4.2. Injury sustained: site, total burn surface area (TBSA), depth and mechanism

4.2.1. Site of injury

Initial information regarding the burns is recorded in Table 2. The majority ($n=13$) of the 19 patients sustained burns beneath the waist, with 8 out of 19 (42%) of patients sustaining burns to both above and below their waist. More than half (53%) of patients sustained burns to the genital or perineal area ($n=10$).

Of the patients that received burns to their lower body (beneath the waist), five underwent operative management.

4.2.2. Total burn surface area (TBSA)

All patients had a TBSA less than 10%. TBSA was estimated by the referring centre and then confirmed and amended if necessary upon arrival.

In this cohort, 12/19 (63%) patients had a TBSA more than or equal to 5% TBSA. The mean TBSA was 5.3% (range 0.5–9.5%).

Table 2 – Age at burn, indication for steam inhalation, TBSA, depth and location of burn.

Age at burn (years)	Steam inhalation indication	TBSA	Depth	Body part affected
0	Common cold	0.5	Superficial partial	Dorsum right foot
0	Blocked nose	6.0	Superficial partial	Upper chest
1	Common cold	6.0	Superficial partial	Chin, neck, right arm and axilla
2	Coryzal symptoms	2.5	Mixed: mid and deep dermal	Dorsum right foot
6	Common cold	6.0	Superficial partial	Lower abdomen, perineum, bilateral legs
6	URTI	4.5	Superficial partial	Genitals, bilateral thighs
8	Common cold	2.0	Mixed: superficial partial and mid-dermal	Lower abdomen, genitalia, bilateral thighs
9	Common cold	9.5	Mixed: mostly superficial partial, some mid dermal	Lower abdomen, bilateral thighs, genitalia
10	Coryzal symptoms	8.0	Superficial	Lower abdomen, perineum, bilateral upper thighs, right foot
16	Not documented	5.0	Superficial partial	Lower abdomen, groin, bilateral thighs
20	Blocked sinuses	8.0	Superficial partial	Right thigh, genitalia, left thigh, buttocks
23	Not documented	2.0	Mixed	Left inner thigh and calf, right medial ankle
26	Common cold	6.0	Superficial partial	Right arm and abdomen
36	Post natal temperatures	4.0	Mixed: Superficial partial and mid dermal	Abdomen, genitalia, inner thighs and buttocks
42	Common cold	7.0	Superficial partial	Abdomen, buttocks, perineum, bilateral upper thighs, right foot
57	Common cold	6.0	Mixed: superficial partial and mid dermal	Bilateral buttocks, right forearm
71	Common cold	4.5	Mixed: superficial partial, mid dermal and deep dermal	Medial left lower leg
74	Blocked sinuses	7.0	Superficial partial and mid dermal	Lower abdomen, perineum and left lower leg
91	Common cold	7.0	Mixed: predominantly superficial partial	Bilateral medial thighs and left lower leg

4.2.3. Depth of burn

The majority of patients had detailed documentation of the initial depth of the burn. Only one patient was recorded as having predominantly superficial burn only. Ten patients were recorded as having superficial partial burns only, with the remaining patients having mixed depth burns comprising superficial partial and mid or deep dermal burns. Of these mixed burns, two patients had deep dermal burns.

4.2.4. Injury mechanism

Only 2/19 (11%) patients were injured with a modern vaporiser, with all others ($n=17$) sustaining injuries during steam inhalation over an open vessel of freshly boiled water. In all 17 cases involving an open vessel, the patients sustained the injuries by knocking the vessel over, causing scald injuries.

The commonest indication for steam inhalation therapy was the common cold ($n=10$), followed by coryzal symptoms

($n=2$) and blocked sinuses ($n=2$). A further 2 patients were using steam inhalation related to common cold or coryzal type symptoms. Two patients did not have a documented indication for steam inhalation therapy and one patient was using steam inhalation to alleviate post-natal fevers.

4.3. Management: burns dressing clinic (BDC), surgery, time to heal and complications

4.3.1. Initial management

Approximately half ($n=9$) of all patients had silver anti-microbial as part of their initial dressing, one of which had both silver sulfadiazine and silver anti-microbial dressings. Two patients received mupirocin and non-adherent dressings as part of their initial management, both because of signs of cellulitis on admission. One patient had predominantly paraffin gauze with some areas of silver sulfadiazine and

Table 3 – TBSA and depth of burn, initial dressing, subsequent surgical management, length of stay (LOS) and any general complications.

TBSA	Depth	Initial dressing	Surgery?	If surgery, what?	LOS	Complications?
0.5	Superficial partial	Non-adherent dressing	No	N/A	1	
2.0	Mixed: superficial partial and mid-dermal	Silver sulfadiazine, non-adherent, silver-coated antimicrobial	No	N/A	2	Admitted for IV abx: delayed presentation
2.0	Mixed	Mupirocin, non-adherent	No	N/A	2	
2.5	Mixed: mid and deep dermal	Non-adherent	No	N/A	2	
4.0	Mixed: superficial partial and mid dermal	Paraffin gauze	Yes	Debridement and SSG to bilateral thigh and perineum	21	
4.5	Superficial partial	Non-adherent, Silver-coated antimicrobial	No	N/A	1	Admitted for IV abx: delayed presentation
4.5	Mixed: superficial partial, mid dermal and deep dermal	Mupirocin, non-adherent	No	N/A	2	
5.0	Superficial partial	Silver-coated antimicrobial, non-adherent	No	N/A	2	
6.0	Superficial partial	Non-adherent	No	N/A	4	
6.0	Superficial partial	Silver-coated antimicrobial	No	N/A	0	
6.0	Superficial partial	Non-adherent, silver-coated antimicrobial	No	N/A	1	
6.0	Superficial partial	Silver-coated antimicrobial	Yes	Debridement and SSG to right thigh	5	
6.0	Mixed: superficial partial and mid dermal	Not recorded	Yes	Debridement and excision burns	9	
7.0	Superficial partial	Silver-coated antimicrobial and silver sulfadiazine	No	N/A	2	Subsequent burn infection with re-admission
7.0	Mixed: predominantly superficial partial	Paraffin gauze	No	N/A	0	
7.0	Superficial partial and mid dermal	Silver-coated antimicrobial, silver sulfadiazine	Yes	SSG left lower leg	14	
8.0	Superficial partial	Atrauman, Silver-coated antimicrobial, silver sulfadiazine	No	N/A	5	
8.0	Superficial	Paraffin gauze	Yes	Debridement and biobrane [®]	5	
9.5	Mixed: mostly superficial partial, some mid dermal	Paraffin gauze, non-adherent, silver sulfadiazine	Yes	Debridement, supratherel [®]	4	

non-adherent dressing, and two patients had paraffin gauze alone (Table 3).

4.3.2. Surgery

All patients in this paper were admitted for a minimum of 12h for monitoring, dressings or for operative management.

Details of initial dressing and subsequent surgery and complications are included in Table 3.

Overall, 32% of patients ($n=6$) underwent surgery for their burns, 2 of which were children and 4 were adults. Three adults underwent debridement and split thickness skin grafting, with one adult undergoing debridement and excision of burn with direct closure.

The two paediatric patients undergoing surgery underwent debridement and biological dressing (either biobrane® or suprathel®).

All procedures were done under general anaesthetic, with all three split skin graft (SSG) operations including local anaesthetic infiltration.

None of the patients underwent multiple operations.

4.3.3. Length of stay (LOS)

The mean length of stay was 4.3 days, with the longest hospital stay being 21 days. Only two patients were admitted for less than 24h. The longest hospital stay was a patient that underwent debridement and split thickness skin grafting to bilateral leg and perineal wounds. The average length of stay for surgical patients was 9.67 days ($n=6$), whereas the average length of stay for non-surgical patients was 1.85 days ($n=13$).

4.3.4. Burns dressing clinic

16/19 (84%) patients returned to the burns dressing clinic, with 2/19 (11%) continuing assessment at their local burns centre. One patient did not attend organised follow up.

Of the 16 that returned to burn dressing clinic, a total of 98 clinic appointments were attended. The lowest number of BDC appointments attended was 1, with one patient attending 20 appointments. Those that attended frequently were attending daily for dressings changes. The mean number of BDC appointments for patients followed up locally was 6.125.

The longest follow up time was 74 days, and this patient was seen in clinic 6 times. The shortest follow up time was 9 days.

4.3.5. Complications

Three patients suffered complications as a result of their burns to date. Two patients were found to have infected burns on admission, both of which received IV antibiotics therapy and

bactroban® dressings. Both of these patients were initially seen and managed at local centres, before being referred to the burns unit due to infection.

One patient developed infection at the site of their burn after initial assessment, undergoing admission and treatment with IV antibiotics.

There were no surgery-associated complications.

4.3.6. Cost

The true cost of steam inhalation scalds is difficult to estimate due to the varied nature of burns and their subsequent treatment. It is important to appreciate this is a crude estimation of costs of steam inhalation scalds, but each burn is likely to represent a unique treatment and hence cost.

The majority of burns patient will undergo regular dressings and serial visits to outpatient clinics, and hence the cost of managing these patients is high. One previous paper [12] examined burns at Chelsea and Westminster Hospital and estimated the costs of caring for burns both as an inpatient and outpatient. These estimates have been extrapolated to estimate the cost and impact of burns in our paper, as detailed in Table 4.

Initial clinic appointments were calculated to take 30min, with follow ups taking 20min. Most clinics were staffed by at least one band 6 nurse and hence cost of clinic was aligned to their salary. The cost of an overnight stay was calculated with 1:4 nursing ratio and 1:6 HCA ratio and based on a recent study in the same burns centre [12].

Whilst not all operation notes had an exact length of procedure, the operation specification was analysed and a total of 6h was estimated for all six procedures. Theatre costs included cost of anaesthetist, surgeons, ODPs, HCAs, scrub nurses and recovery room time [12].

The total cost for treating these 19 patients was found to be £31,872. This cost is likely to be an underestimate, as not included is the cost of specialist dressings, or for any consultations that may have taken over the estimated times.

5. Discussion

5.1. Summary

This study highlights that despite an equivocal evidence base, steam inhalation continues to be a home remedy for coryzal or common cold like symptoms. It also displays that despite warnings from NICE regarding its dangers, steam inhalation is

Table 4 – Estimated costs of medical provisions.

Medical provision	Cost	Times used Jan'18-Dec 2019	Cost
BDC nurse 6/h	£30		
30min initial appt	£15	16 initial appts	£240
20min follow up	£10	82 follow ups	£820
		98 total clinic appointments	£1,060
Burns ward/night (1:4 nursing with 1:6 HCA ratio)	£347	82 total nights	£28,454
Burns operating theatre/4hr	£1572	6 operating slots	£2358
		Total	£31,872

Two patients sought follow up locally and hence had no clinic appointments. One patient DNA f/up.

a significant contributor to scald injuries not only in children but also in adults.

In our centre there were an average of 1.6 patients admitted each month for scald injuries related to steam inhalation, with >30% undergoing surgery of some form. All but three patients suffered burns to their lower body (beneath waist) and the average patient spent 4.3 days in hospital. Three patients to date suffered complications as a result of their burns.

The patients in this series encompassed a wide age range. Although it was not recorded whether or not the burns occurred under direct supervision, it could be hypothesised from the ages alone that burns occurred in young children under adult supervision, in children without adult supervision and in adults alone.

More modern methods of steam inhalation have been proposed. Modern vaporisers use electricity to power a heating element, boiling water and creating steam for inhalation. This hypothetically eliminates the risk of spilling hot water from an open vessel. Whilst only 2 out of 19 of the burns in this series sustained injuries with modern vaporisers, this demonstrates that they are still not risk free. This has been confirmed in a previous paper which showed that even with modern vaporisers, scald burns to the hands are a serious risk [4].

If steam inhalation is to be practised in children, an alternative, safer method advocated in respiratory text [13,14] is steam inhalation by close contact. This involves cuddling the child whilst running a bath or shower with the windows and door closed. Whilst one study [15] found no benefit in symptoms from this method, it has been shown to be safe and associated with much less scald injuries [4].

Steam inhalation scalds are not an issue unique to our burns centre. A recent International Burns Injury Database (IBID) request found that over the same two year time period, there were 201 steam inhalation related scald injuries sustained nationally. Subset analysis showed in 2018 there were 47 paediatric related injuries, 37 adult and 8 elderly related injuries. This is compared to 2019, when there were 49 paediatric injuries, 48 adult injuries and 12 elderly burns. Whilst there has only been a modest increase from 2018 to 2019, the constant number of injuries is of significant concern.

5.2. Review of the literature

Given the widespread use of steam inhalation and the public's belief in its apparent benefits, primary prevention is vital in avoiding steam inhalation related scald injuries. This has been acknowledged in several countries, including The Netherlands where several patient brochures have warned of the risks of steam inhalation [16–18].

In the UK, the advice from NICE [5] is that during steam inhalation “care should be taken to avoid scalding”. It also advised “sitting in the bathroom with a running hot shower is a safe option.” However, the worry is whether the government's advice is being passed on to patients. A previous study [11] in 2016 looked at steam inhalation scalds in the paediatric population. In its survey of GPs in Wales, it found that 81% (n=17) had advised patients to use steam inhalation in their career. More worryingly, only a small proportion of GPs were aware of evidence pertaining to the use of steam inhalation, and none were aware of the results of the 2013 Cochrane

review [1]. Less than a quarter of GPs reported the potential risk of scalds using steam inhalation [11].

More recently, The British Association of Plastic, Reconstructive and Aesthetic Surgeons (BAPRAS) has instigated a Twitter campaign to minimise the frequency of typical injuries encountered by plastic surgeons, to reduce the burden on the NHS during the coronavirus pandemic. Amongst other household injuries, they mention steam inhalation [19]. They advise that there is no evidence to suggest steam inhalation helps ease the symptoms of COVID-19, a sentiment echoed by the British Burn Association (BBA) [20]. BAPRAS and BBA also explain how to safely carry out steam inhalation, including placing bowls on a fixed, flat surface or trialling steam inhalation by close contact.

Worryingly, the warnings do not seem to be having the desired effect. A recent letter published in *The Lancet* [21] expressed concern over the increased use of steam inhalation for symptomatic treatment during the COVID-19 pandemic, with a subsequent increase in paediatric scald injuries. The authors reported 30-fold increase at their centre in the number of paediatric scalds directly resulting from steam inhalation since the start of UK lockdown. In their survey of English burns centres, they also found that 50% of centres have had an increase in scalds relating to steam inhalation. However, it is worth bearing in mind the authors relied on an ad hoc survey of only a proportion of the burn services, did not specify the nature of services who did not respond and relied on the recollection of those contacted.

In the aforementioned paper by Al Himdani et al. [11] most scalds were sustained by tipping hot water from bowls, a mechanism also backed up by other papers [4,10]. It is obvious most GPs would not recommend steam inhalation by placing vessels of boiling water directly on laps or on unstable surfaces. It is likely that misunderstandings and miscommunications may occur during consultations when advice on steam inhalation is given, meaning patients then go on to practice steam inhalation in an unsafe manner.

Further research is needed into the general public consensus on steam inhalation and its perceived benefits. This research could then be used to design and implement educational resources targeted at reducing incidence of steam inhalation related scalds.

Another possible area of research could focus on the communication of steam inhalation in GP consultations, investigating the difference between what GPs recommend and what patients actually do.

5.3. Strengths and limitations

In this paper, patients were first identified from the burns audit database and subsequent data could be extracted from the patient's electronic files. Detailed documentation of the patient's admission, dressings and subsequent treatment allowed the authors to collect a wide range of data.

Data collection was limited by the fact it was a retrospective, single centre study. Furthermore, the retrospective nature of the study introduced an element of selection bias for a number of reasons.

Firstly, the database did not contain patients that were treated in the outpatient department but not admitted for scald burns secondary to steam inhalation. Similarly, any patients admitted for less than 12h could not be identified

using the database search, as only patients that spent more than twelve hours in hospital were classed as admitted.

The authors also appreciate that many burns patients are managed at home, at GP surgeries or at local hospitals, so would not have presented to the regional burns centre.

The above reasons are likely to contribute to the impact of steam inhalation related scalds from our study being an underestimate.

6. Conclusion

“First do no harm” is a fundamental principle of medicine. This paper has built on a previous literature base that steam inhalation is associated with significant risks and complications, despite an equivocal evidence base. Our paper has demonstrated the far-reaching extent of these risks both in terms of serious injury to the patient and the cost of treating those affected. It is our feeling that the potential risks of steam inhalation therapy outweigh the potential benefits and this has been demonstrated clearly in the groups affected by scald injuries in this study.

Primary prevention is key in reducing the frequency of injuries from steam inhalation, and more must be done to educate the general public on the risks of steam inhalation. It is vital plastics surgeons’ work together with general practitioners, policy makers and the media to reduce the burden of such injuries.

Declaration of competing interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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REFERENCES

- [1] Singh M, Singh M, Jaiswal N, Chauhan A. Heated, humidified air for the common cold. *Cochrane Database Syst Rev* 2017;8: CD001728.
- [2] Umoren R, Odey F, Meremikwu MM. Steam inhalation or humidified oxygen for acute bronchiolitis in children up to three years of age. *Cochrane Database Syst Rev* 2011;19 (January 1):CD006435.
- [3] Moore M, Little P. Humidified air inhalation for treating croup: a systematic review and meta-analysis. *Fam Pract* 2007;24 (September 4):295–301.
- [4] Wallis BA, Turner J, Pearn J, Kimble RM. Scalds as a result of vapour inhalation therapy in children. *Burns* 2008;34(June 4):560–4.
- [5] Common Cold-management. What self-care advice should i give to someone with the common cold? [Internet]. Summaries. NHS Clinical Knowledge; 2016 Available from: <https://cks.nice.org.uk/common-cold#!scenario>.
- [6] Mathew JL. Steam inhalation in respiratory illnesses—full steam ahead or full stop? A systematic review of randomized controlled trial. *Indian Pediatr* 2010;47(December 12):1047–50.
- [7] Sanyaolu L, Javed MU, Eales M, Hemington-Gorse S. A 10 year epidemiological study of paediatric burns at the Welsh Centre for burns and plastic surgery. *Burns* 2017;43(May 3):632–7.
- [8] Belmonte JA, Domínguez-Sampedro P, Pérez E, Suelves JM, Collado JM. Severe burns related to steam inhalation therapy. *An Pediatr (Barc)* 2015;82(February 2):95–9.
- [9] Barrow RE, Spies M, Barrow LN, Herndon DN. Influence of demographics and inhalation injury on burn mortality in children. *Burns* 2004;30(February 1):72–7.
- [10] Baartmans M, Kerkhof E, Vloemans J, Dokter J, Nijman S, Tibboel D, et al. Steam inhalation therapy: severe scalds as an adverse side effect. *Br J Gen Pract* 2012;62(July 600):e473–7.
- [11] Al Himdani S, Javed MU, Hughes J, Falconer O, Bidder C, Hemington-Gorse S, et al. Home remedy or hazard? Management and costs of paediatric steam inhalation therapy burn injuries. *Br J Gen Pract* 2016;66(March 644):e193–9.
- [12] Begum F, Khajuria A, Abdi H, Williams A, Jones I, Leon-Villapalos J, et al. In hot water: the impact of burn injuries from hot water bottles – experience of a UK burns unit and review of the literature. *Burns* 2019;45(4):974–82.
- [13] Henry R. Moist air in the treatment of laryngotracheitis. *Arch Dis Child* 1983;58(August 8):577.
- [14] Bourchier D, Dawson KP, Fergusson DM. Humidification in viral croup: a controlled trial. *Aust Paediatr J* 1984;20 (November 4):289–91.
- [15] Forstall GJ, Macknin ML, Yen-Lieberman BR, Medendrop SV. Effect of inhaling heated vapor on symptoms of the common cold. *JAMA* 1994;271(April 14):1109–11.
- [16] Patient letter by the Dutch College of General Practitioners (NHG). Nose and sinusitis in adults. (In Dutch). [Internet]. 2005 Available from: http://nhg.artsennet.nl/kenniscentrum/k_voorlichting/NHGPatientenbrieven/NHGPatientenbrief/Neusenbijnholteontstekingbijvolwassenen.htm [cited 28.04.20].
- [17] Patient letter by the Dutch College of General Practitioners (NHG). Colds in children. (In Dutch) [Internet]. 2011 Available from: http://nhg.artsennet.nl/kenniscentrum/k_voorlichting/NHGPatientenbrieven/NHGPatientenbrief/PBR8b.htm [cited 28.04.20].
- [18] Patient letter by the Dutch College of General Practitioners (NHG) common cold. (In Dutch). [Internet]. 2011 Available from: http://nhg.artsennet.nl/kenniscentrum/k_voorlichting/NHGPatientenbrieven/NHGPatientenbrief/PBR8a.htm [cited 24.04.20].
- [19] BAPRASvoice. #NHS resources are under more strain than ever during the #COVID19 pandemic so we’re sharing advice on how to prevent some typical injuries treated by #PlasticSurgeons, starting with steam inhalation Dash symbol Look after yourself, look after the NHS #StaySafeStayHome #SafetySaveslives [Internet]. 2020 Available from: <https://twitter.com/BAPRASvoice/status/1243152966523199489> [cited 28.04.20].
- [20] British Burn Association. Public Alert: Beware of Severe Scald with Steam Inhalation [Internet]. Available from: <https://www.britishburnassociation.org/wp-content/uploads/2020/04/Steam-Inhalation-Flyer.pdf>.
- [21] Brewster CT, Choong J, Thomas C, Wilson D, Moiemmen N. Steam inhalation and paediatric burns during the COVID-19 pandemic. *Lancet* 2020.